

ORAL PRESENTATIONS

Table 1. RPCF improves profitability on E. coli problem farms

Farm Identification U.S.)	Number Pigs on Test	Mortality difference (%)	Annual Value to Producer (\$
1	2619	4.80	6240
2	1000	5.00	20,000
3	13,644	6.20	66,960
4	11,218	0.80	8600
5	6195	0.85	9180

Trichinae Certification in the United States Pork Industry

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**Summary:** We report here on progress in the Trichinae Certification pilot program. This program uses an on-farm auditing system to document good production practices (GPPs) for swine relative to the risk of exposure to *Trichinella spiralis*. The pilot phase of this program continues while regulations to establish it as an official USDA program are being developed. Launch of the Trichinae Certification Program in the United States is expected to take place when regulations are finalized within the next year. The *Trichinella* certification program establishes a process for ensuring the quality and safety of animal-derived food products from the farm through slaughter.

**Keywords:** Food Safety, *Trichinella spiralis*, Pork, Trichinellosis, Preharvest Pork Safety.

**Introduction:** Control of *Trichinella* infection in U.S. pork has traditionally been accomplished by inspection of individual carcasses at slaughter or by post-slaughter processing to inactivate parasites. Declines in prevalence of this parasite in domestic swine during the last thirty years, coupled with improvements in pork production systems, allows pork safety, relative to *Trichinella* infection, to be documented at the farm level. We report here on progress in the Trichinae Certification pilot program.

**Materials and Methods:** Knowledge of risk factors for exposure of swine to *Trichinella spiralis* were used to develop an objective audit that could be applied to pork production sites. In a pilot study, 359 production site audits were performed by trained veterinary practitioners. Verification testing of swine raised on audited sites was subsequently performed using an ELISA test.

**Results:** The production site audit includes an assessment of farm management, bio-security, feed and feed storage, rodent control programs, and general hygiene. In pilot studies, objective measures of management practices were obtained through a review of production records and a site inspection. Of the 359 production site audits, 342 audits (95.3%) indicated adherence to management practices that met program standards and these sites were granted either entry into the program, or program certification. These sites will be audited regularly on a schedule established for the Trichinae Certification Program. Those sites that were audited and did not meet program standards for management practices did not gain entry into the program. Verification testing of swine from audited

production sites is ongoing at the slaughter plant. To date, random verification testing of swine from sites in the pilot program has resulted in only negative results for *Trichinella* infection.

**Discussion:** *Trichinella spiralis* is a parasitic nematode affecting animals and man. The disease caused by this parasite, trichinellosis, is acquired by consuming encysted larvae of *Trichinella spiralis* in the muscle tissue of an infected animal. Consumption of undercooked pork has traditionally been a common source of trichinellosis in humans worldwide. In the U.S. the prevalence of this organism in pigs has dropped sharply due to changes in swine management practices within the U.S. pork industry. In 1900, greater than 2.5% of the pigs tested were found to be infected with *Trichinella*. The infection prevalence declined to 0.95% in the 1930's, 0.63% in 1952, 0.16% in 1965, and 0.12% in 1970. The USDA National Animal Health Monitoring System's National Swine Survey in 1995 showed an infection rate of 0.013% (Gamble & Bush 1998). The same survey in 2000 demonstrated that the infection rate in U.S. swine had fallen to 0.007% (Bush 2002).

In the mid 1980s the convergence of three factors provided a powerful rationale for the development of industry supported programs to improve food safety in the U.S. First, the prevalence of *Trichinella* in U.S. swine had reached such a low level that disease free status could be envisioned. Second, there was recognition by U.S. pork industry leaders that international markets were closed to U.S. producers and U.S. pork products because of the now inaccurate perception that U.S. produced pork had a comparatively high risk of harboring *Trichinella*. Finally, the development of a rapid, ELISA-based diagnostic test provided a relatively inexpensive tool, which could be utilized in a control program.

The U.S. Trichinae Certification Program is a developing USDA program based on scientific knowledge of the epidemiology of *Trichinella spiralis* and numerous studies demonstrating how specific good production practices (GPPs) can prevent exposure of pigs to this zoonotic parasite. This program is a model program for on-farm assurance of product safety. The International Commission on Trichinellosis in their publication, Recommendations on Methods for the Control of *Trichinella* in Domestic and Wild Animals Intended for Human Consumption, states that, "Modern swine production systems reduce or eliminate risks of swine infection with *Trichinella* and testing of individual animals raised under these conditions could be eliminated." (Gamble et al., 2000). This publication continues with details of the requirements of such production systems. The Trichinae Certification Program meets these standards in all respects.

The U.S. Trichinae Certification Program is regulated by the U.S. Department of Agriculture (USDA). Collaborative efforts between the USDA's Animal and Plant Health Inspection Service (APHIS), the Food Safety Inspection Service (FSIS), and the Agricultural Marketing Service (AMS) assure that certified pork production sites manage and produce pigs according to the requirements of the program's GPPs and verify the identity of pork from the certified production site through slaughter and processing.

**Conclusions:** The described Trichinae Certification Program establishes a process for ensuring the quality and safety of animal-derived food products from the farm through slaughter. Uniform standards stating the requirements of this program have been developed and federal regulations in support of the program are being developed. This USDA program will serve as a model for the development of other quality and safety initiatives.

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## Fermented Liquid Feed: The potential for eliminating enteropathogens from feed

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**Summary:** The aim of this study was to determine the effect of temperature on the survival of *Salmonella* and *E. coli* in fermented liquid pig feed (FLF). Liquid feed, fermented with *Lactobacillus plantarum*, was challenged with *Salmonella* or *E. coli* (six serovars of each) at 20, 30 or 37 °C. Temperature significantly affected the survival of *Salmonella* and *E. coli*. In FLF containing *ca* 230 mmol L<sup>-1</sup> lactic acid the mean decimal reduction time (D) for *Salmonella* was reduced from 157 (±10) min at 20 °C to 12 (±1.5) min at 30 °C and < 5 min at 37 °C. Likewise, the mean D for *E. coli* was significantly reduced from >180 min at 20 °C to 30 (±12.7) min at 30 °C and 21 (±6.2) min at 37 °C. These studies suggest that successful elimination of potential pathogens from liquid feed can be achieved through fermentation with appropriate lactic acid bacteria and temperature control.

**Keywords:** *Salmonella*, *E. coli*, pigs, lactic acid, *Lactobacillus*

**Introduction:** Liquid feed (LF) is often fed to grower and finisher pigs in UK and Europe. However, unless steps are taken to prevent it, liquid feed has the potential to be a vector for pathogenic microorganisms. The risk of proliferation of both pathogenic and spoilage organisms in LF can be reduced by fermenting LF with lactic acid bacteria (Brooks et al., 2001). A typical fermented liquid feed (FLF) has a pH of 3.8 – 4 and contains 150 – 250 mmol L<sup>-1</sup> lactic acid, which enables it to withstand contamination by other microorganisms including pathogens such as salmonellae. However, extrinsic environmental factors such as temperature may affect both the ability of lactic acid bacteria to grow and produce lactic acid and the survival of enteropathogens in FLF (Beal et al., 2002). The aims of this study were to determine the affect of temperature and fermentation time on the generation of lactic acid and the survival of *Salmonella* and *E. coli* in FLF.

**Materials and Methods:** A commercial piglet diet was sterilized (25 kGy g irradiation), mixed with sterile distilled water (2.5 water:1 feed), inoculated with *ca* 10<sup>6</sup> cfu ml<sup>-1</sup> *Lactobacillus plantarum* and incubated at 20, 30 or 37 °C for 48, 72 or 96 h. Samples of the resultant FLF's were taken for lactic and acetic acid analysis by high performance liquid chromatography. FLF's were inoculated (in triplicate) with *ca* 10<sup>7</sup> cfu g<sup>-1</sup> of the *Salmonella* serovars: Typhimurium, DT104B(342A), DT104B(342B), DT193(20), Derby(16), Goldcoast(245) and Anatum(41A) and *E. coli* serovars: K88(99), K88(100), K88(101), K99(185), K99(230) and O157:H7. FLF's were maintained at 20, 30 or 37 °C and samples taken at appropriate time intervals for the enumeration of *Salmonella* and *E. coli* using standard plate count techniques.